

# FEEDING HABITS OF PHYTOPARASITIC NEMATODES IN PLANT ROOTS.

R. P. Esser<sup>1</sup>

To reduce or eliminate populations of plant parasitic nematodes in Florida plant nurseries by utilization of sanitation measures, or by application of nematicides, knowledge concerning the feeding habit of the target pest can be of prime importance. Phytoparasitic nematodes derive nourishment from plant roots by inserting their stylets into a root cell, after which the nematode injects digestive enzymes into the cell. Enzymes from the nematode reduce the root cell contents into a free flowing, nutritious liquid which is now able to pass through the extremely small stylet orifice and channel. The nematode promptly pumps the liquified cell contents into its body, using a very muscular oval structure (metacarpus) in the esophagus. The object of this paper is to show the different ways nematodes orient themselves in relation to the root while feeding.

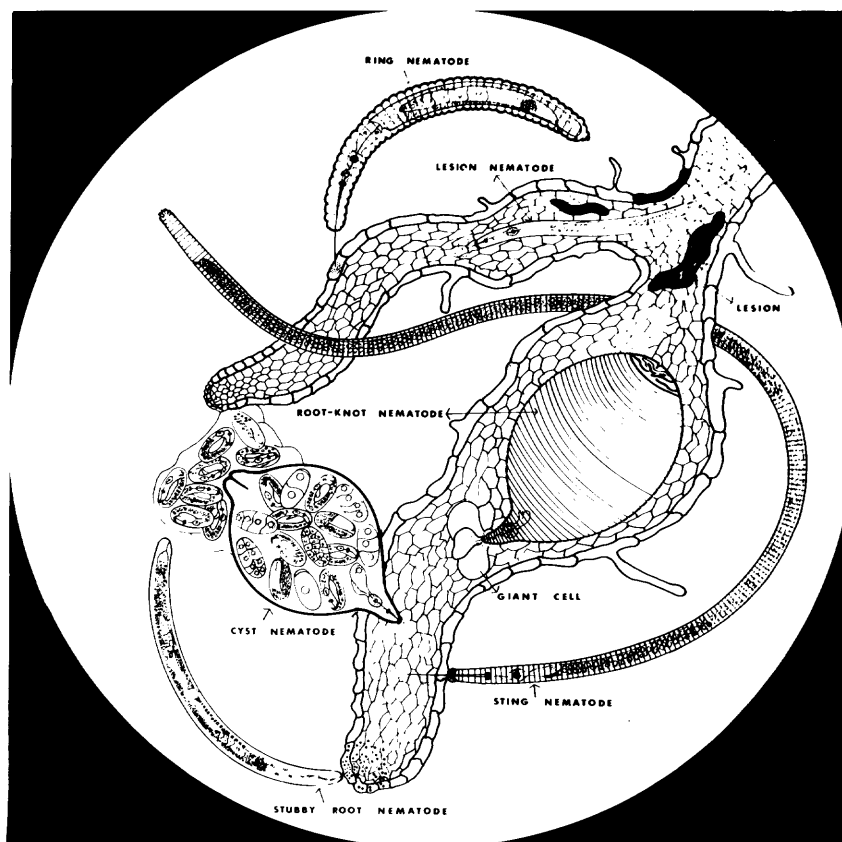


Fig. 1. A plant root under attack by three types of root feeding nematodes. External root feeders: Ring, Sting, and Stubby root nematodes. Partially inserted root feeders: Cyst nematode. Internal root feeders: Lesion and Root-knot nematodes.

<sup>1</sup>Nematologist, Bureau of Nematology, P.O. Box 1269, Gainesville, FL 32602

In some cases, the nematode feeding habit will determine the mode of the corrective measure to be exercised against the pest. In other cases, this knowledge will provide simple, inexpensive means to reduce or eliminate nematode pests. Occasionally, feeding habit knowledge will render pest control impractical, if not impossible.

Three basic feeding habits are utilized by nematodes:

External root feeders	(Ectoparasites)
Partially inserted root feeders	(Semi-endoparasites)
Internal root feeders	(Endoparasites)

Following is a definition of each of the three feeding habits and the importance of each in nematode control.

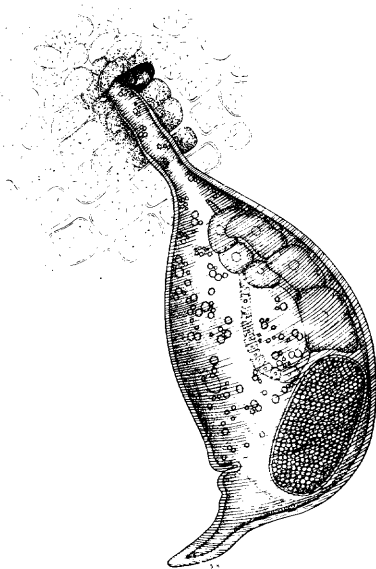


Fig. 2. Citrus nematode shallowly inserted in the root. (After Gutierrez)

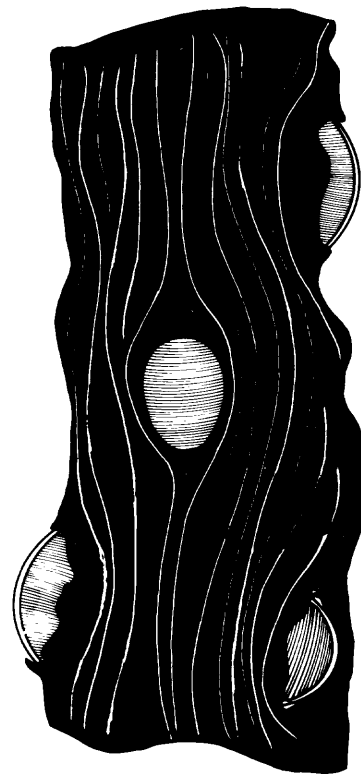


Fig. 3. Pine cystoid nematode deeply inserted in the root.

**External root feeders:** Nematodes that possess this habit feed with the entire body outside of the root. (Fig. 1. Ring, sting, and stubby root nematodes). External root feeders penetrate the root only with their stylets. Many external root feeders, such as sting and dagger nematodes, possess long spears that penetrate deeply into the plant. Almost all external root feeders have eel-like bodies that facilitate migration in soil to reach new feeding sites. Table 1 lists external feeding nematodes considered serious plant pests.

Table 1. External feeding plant parasitic nematode genera.

<u>Belonolaimus</u> (sting nematodes)	<u>Longidorus</u> (needle nematodes)
<u>Criconemella</u> ring nematodes)	<u>Trichodorus</u> (stubbyroot nematodes)
<u>Dolichodorus</u> (awl nematodes)	<u>Tylenchorhynchus</u> (stunt nematodes)
<u>Hemicyclophora</u> (sheath nematodes)	<u>Xiphinema</u> (dagger nematodes)

**Control Potential:** External feeders are most vulnerable to almost all types of control because their bodies and eggs lie exposed in the soil or on plant roots where nematicides can easily reach them. A thorough washing of plant roots with a hard water spray will eliminate most or all of these pests when plants are removed for transplanting, or bare root sale. Nematicidal treatment by soil drenches or root dips will also be very effective against external feeders.

**Partially inserted root feeders:** This group (Table 2) includes nematodes that feed as adults with part of their bodies embedded in the root, and part of their bodies exposed in the rhizosphere (Fig. 1, cyst nematode). Exposure outside of the root occurs in varying degrees both within populations and between genera. Most of the body may lie exposed as with citrus nematodes (Fig. 2), or just a small part of the rear end may protrude as with pine cystoid nematodes (Fig. 3). Almost all partially inserted feeders possess short stylets.

Table 2. Partially inserted root feeding plant parasitic nematodes.

** <u>Globodera</u> (cyst nematodes)	** <u>Meloidodera</u> (cystoid nematodes)
* <u>Helicotylenchus</u> (spiral nematodes)	** <u>Heterodera</u> (cyst nematodes)
* <u>Rotylenchulus</u> (reniform nematodes)	<u>Tylenchulus</u> (citrus nematodes)
* <u>Hoplolaimus</u> (lance nematodes)	
* May also feed externally	** Partially inserted feeders as adults.

**Control Potential:** Since part of the body and eggs lie exposed in the rhizosphere or soil, partially inserted feeders are also vulnerable to chemical control. Washing plant roots with hard water sprays will remove many of these pests if the nematodes are not embedded too deeply or snugly. Chemical drenches or dips will be very effective against adults since part of the body lies exposed outside of the root.

**Internal root feeders:** Nematodes in this category have short stylets and feed with their bodies entirely enclosed by root tissue (Fig. 1. Lesion and root-knot nematodes). Table 3 lists the internal root feeding plant parasites.

Table 3. Internal root feeding plant parasitic nematodes.

* <u>Globodera</u> (cyst nematode)	<u>Nacobbus</u> (false root-knot nematode)
* <u>Heterodera</u> (cyst nematode)	<u>Pratylenchus</u> (lesion nematode)
<u>Hirschmanniella</u> (cyst nematode)	<u>Radopholus</u> (burrowing nematode)
<u>Meloidogyne</u> (root-knot nematode)	

\* Internal root feeders only in juvenile stages

**Control Potential:** Internal root feeders are totally protected by root tissue and are the most difficult to control and consequently, comprise some of the most serious pests of plants.

Root washing will wash away egg clusters of some internal feeders but will have no effect on nematodes inside the root. Chemical control, except for systemic nematicides, is more difficult and sometimes not feasible because of the plant tissue barrier. Hot water immersion (52 C for 10 min.) will eradicate most inside feeders. Unfortunately, not all plants can survive this treatment.

---

Contribution No. 394, Bureau of Nematology

<p>This publication was issued at a cost of \$674.82 or \$0.19 per copy to provide information on proper recognition of plant pests.</p> <p style="text-align: right;">PI90T-13</p>
---